R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

THE CLAIMS

Claims 1-15 have been amended only to make some minor grammatical improvements so as to put them in better form for issuance in a U.S. patent.

In addition, claims 16-18 have also been amended to make some minor grammatical improvements, as well as to be directed to a computer-readable recording medium so as to recite statutory subject matter under 35 USC 101.

Still further, new claims 19-30 have been added to recite the subject matter of claims 4-9 depending from independent claims 2 and 3, respectively, and new claims 31 and 32 have been added to recite the subject matter of claim 15 depending from claims 13 and 14, respectively.

No new matter has been added, and it is respectfully requested that the amendments to the claims be approved and entered, and that the rejection under 35 USC 101 be withdrawn.

CLAIM FEE

The application was originally filed with 18 claims of which 6 were independent, and the appropriate claim fee was paid

for such claims. The application now contains 32 claims, of which 6 are independent. Accordingly, a claim fee in the amount of $624 for the addition of 12 extra claims in total is submitted herewith. In addition, authorization is hereby given to charge any additional fees which may be determined to be required to Account No. 06-1378.

THE PRIOR ART REJECTION

Claims 1, 12, 15 and 16 were rejected under 35 USC 102 as being anticipated by USP 7,015,961 ("Kakarala"), and claims 2-11, 13, 14, 17 and 18 were all rejected under 35 USC 103 as being obvious over Kakarala in view of one or more of USP 5,552,827 ("Maenaka et al"), USP 7,053,944 ("Acharya et al"), and USP 6,091,862 ("Okisu"). These rejections, however, are respectfully traversed.

According to the present invention as recited in independent claim 1, an image pickup system is provided for processing an image signal at each pixel, which image signal comprises a plurality of color signals and wherein one or more of the color signals are dropped out according to the location of the pixel. The image pickup system includes first interpolation means for interpolating the color signals dropped-out from the image signals by a first interpolation method, precision verification means for verifying the interpolation precision based on the

image signals and the color signals interpolated by the first interpolation means, and second interpolation means for interpolating the color signals dropped-out from the image signals by a second interpolation method that is different from the first interpolation method in cases where it is judged that the interpolation precision by the first interpolation method is insufficient. Independent claim 16, moreover, recites similar features expressed as functions performed by a computer program recorded on computer-readable medium.

According to the present invention as recited in independent claim 2, an image pickup system is provided for processing an image signal at each pixel, which image signal comprises a plurality of color signals and wherein one or more of the color signals are dropped out according to the location of the pixel. The image pickup system includes separation means for separating the image signals into first image signals and second image signals based on predetermined characteristics relating to the image signals, first interpolation means for interpolating the dropped-out color signals from the first image signals by a first interpolation method, second interpolation means for interpolating the dropped-out color signals from the second image signals by a second interpolation method that is different from the first interpolation means, and precision verification means for verifying the interpolation precision based on the first

image signals and the color signals interpolated by the first interpolation means for the regions of the first image signals, and verifying the interpolation precision based on the second image signals and the color signals interpolated by the second interpolation means for the regions of the second image signals. Further, the image pickup system includes adjustment means for causing interpolation processing of the dropped-out color signals to be performed again from the image signals by the second interpolation means when insufficient interpolation was performed by the first interpolation means, and for causing interpolation processing of the dropped-out color signals to be performed again from the image signals by the first interpolation means when insufficient interpolation was performed by the second interpolation means, in cases where it is judged that the interpolation precision is insufficient. Independent claim, moreover, recites similar features expressed as functions performed by a computer program recorded on computer-readable medium.

According to the present invention as recited in independent claim 3, an image pickup system is provided for processing an image signal at each pixel, which image signal comprises a plurality of color signals and wherein one or more of the color signals are dropped out according to the location of the pixel. The image pickup system includes first interpolation means for

interpolating the color signals dropped-out from the image signals by a first interpolation method, second interpolation means for interpolating the color signals dropped-out from the image signals by a second interpolation method that is different from the first interpolation method, precision verification means for verifying the interpolation precision based on the image signals, the color signals interpolated by the first interpolation means and the color signals interpolated by the second interpolation means, and selection means for selecting color signals having a higher interpolation precision between the color signals interpolated by the first interpolation means and the color signals interpolated by the second interpolation means. Independent claim 18, moreover, recites similar features expressed as functions performed by a computer program recorded on computer-readable medium.

With the structure of the claimed present invention, the image pickup system performs a first interpolation processing of dropped-out or missing color signals and then separately performs a second interpolation processing of dropped-out color signals, which may the same dropped-out color signals, wherein a "dropped-out color signal" or dropped-out pixel is a pixel which does not exist on the color plane until interpolated. The first interpolation processing by the first interpolation means may be performed, for example, using equations 1-40 set forth in the

specification on pages 18-29. The second interpolation processing by the second interpolation means may be performed, for example, using equation 42 set forth in the specification on pages 34 and 35, when the image pickup system determines that the first interpolation precision is not sufficient (as set forth, for example, in claim 1). For example, assuming R22 in Fig. 4 is a pixel of interest, if the interpolation precision by the first interpolation means is determined to be insufficient, then the second interpolation means re-interpolates G22 and B22 of the missing color signals.

Accordingly, with the structure of the claimed present invention, the second interpolation means interpolates color signals that do not exist on the image, i.e., color signals dropped-out from the image signals. That is, the dropped-out color signals do not exist on the color plane until interpolated by either the first or the second interpolation means, as according to the claimed present invention.

It is respectfully submitted that interpolation processing of dropped-out color signals by the first and second interpolation means as according to the claimed present invention differs fundamentally from correction processing of defective pixels wherein a pixel which exists on the color plane but is defective is processed in order to be correct and to remove the defective nature thereof.

It is respectfully submitted that the cited prior art references fail to disclose, teach or suggest first and second interpolation means for interpolating color signals dropped-out from the image signals using different interpolation methods.

Kakarala performs interpolation processing of dropped out pixels, and correction processing of defective pixels after the interpolation processing. In the interpolation processing of Kakarala, all dropped-out values are interpolated using the median of surrounding neighboring values to produce an interpolated color plane (85) (step 900, see column 11, lines 1-67 and Figs. 8 and 9), and then, if any pixels are defective on the generated interpolated color plane (85) (step 920), correction processing is performed in which sensor values of the defective pixels are replaced by sensor values derived from the sensor value of neighboring pixels (step 930) (see column 11, lines 9-17 and column 11, lines 43-45). Thus, the correction processing of Kakarala is performed only for replacing only defective pixels, for example if R are defective pixels on the interpolation processed color plane, then they are replaced using other R and r that already exist. Similarly, if G are defective pixels, they are replaced using other G and g that already exist, and if B are the defective pixels, they are replaced using other B and b that already exist.

It is respectfully submitted that the correction processing of Kakarala does not interpolate dropped-out pixels which do not exist on a color plane, and that Kakarala does not disclose or suggest two interpolation means which perform interpolation of color signals using different interpolation methods, as according to the claimed present invention. Instead, Kakarala merely corrects defective pixels that already exist on the color plane, and which are not dropped-out of the image signal.

Okisu, moreover, also discloses a pixel interpolation device which performs interpolation processing of defective pixels, and which also performs contour correction processing on an image containing the interpolation-processed pixels. In Okisu, the contour correction processing entails extracting edge components using a Laplacian filter on the interpolated signal, multiplying the resultant signal by a predetermined gain value, and adding the multiplied data to the original data (see column 4, line 63 to column 5, line 8, and Fig. 3 of Okisu).

It is respectfully submitted, however, that the correction processing of Okisu et al does not interpolate dropped-out pixels which do not exist on a color plane, and that Okisu et al also does not disclose or suggest two interpolation means which perform interpolation of color signals using different interpolation methods, as according to the claimed present invention.

In sum, Kakarala and Okisu et al do not disclose, teach or suggest an image pickup system including first interpolation means for interpolating color signals dropped-out from the image signals using a first interpolation method, and second interpolation means for interpolating the same dropped-out color signals using a second interpolation method different from the first interpolation method, as according to the present invention as recited in each of independent claims 1-3 and 16-18.

In addition, with respect to independent claims 3 and 18, it is respectfully submitted that neither Kakarala nor Okisu et al discloses or suggests precision verification means for verifying the interpolation precision based on the image signals, the color signals interpolated by the first interpolation means and the color signals interpolated by the second interpolation means. Kakarala does disclose verifying defective pixels in step 920 (i.e., whether or not color plane (85) after the interpolation processing includes defective pixels) but does not verify multiple color signals interpolated by two different interpolation means.

Still further, it is respectfully submitted that Maenaka et al nor Acharya et al also fail to disclose or suggest first and second interpolation means which perform interpolation of color signals using different interpolation methods, as according to the claimed present invention.

In view of the foregoing, it is respectfully submitted that independent claims 1-3 and 16-18, and claims 4-15 and new claims 19-32 respectively depending therefrom, all clearly patentably distinguish over cited references, taken singly or in any combination, under 35 USC 102 as well as under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

/Douglas Holtz/

Douglas Holtz
Reg. No. 33,902

Frishauf, Holtz, Goodman & Chick, P.C.
220 Fifth Avenue - 16th Floor
New York, New York 10001-7708
Tel. No. (212) 319-4900
Fax No. (212) 319-5101

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